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Idaho Operations Office

INEEL CERCLA Disposal Facility Groundwater Detection Monitoring Program: Data Analysis Plan

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Prepared for the
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ABSTRACT

This Data Analysis Plan describes the approach that will be used to evaluate groundwater data collected in support of the INEEL CERCLA Disposal Facility (ICDF) detection monitoring program to ensure compliance with substantive requirements of detection monitoring found in Subpart F of the Resource Conservation and Recovery Act. This is an ICDF applicable or relevant and appropriate requirement under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

Currently, this Data Analysis Plan addresses the evaluation of the groundwater data associated with the Snake River Plain Aquifer wells. Due to the limited extent and transient nature of the perched water underneath the ICDF Complex, the Agencies will make a decision in spring 2003 whether it is appropriate to add perched water to the detection monitoring program. If perched water is added, an agreement will be reached as to how to evaluate the data and this Data Analysis Plan will be updated.

Of the acceptable methods listed in the Code of Federal Regulations (CFR) (40 CFR 264.97(h)), the ICDF detection monitoring program will use either prediction intervals as allowed in 40 CFR 264.97(h)(3) or control charts as allowed in 40 CFR 264.97(h)(4) to evaluate the groundwater monitoring data for statistically significant evidence of contamination. The specific method to be used for each constituent will be determined from the results of the background sampling and existing literature on constituent distributions.

For those constituents with at least 50% detected concentrations and where the distribution is approximately normal or lognormal, a combined Shewhart-Cumulative Sum control chart method will be followed. For the remaining constituents, a nonparametric prediction interval method will be followed. For both of the selected methods, the applicable limits are based on the background information.

CONTENTS

ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CUSUM	cumulative sum
DOE-ID	Department of Energy Idaho Operations Office
EPA	Environmental Protection Agency
HWMA	Hazardous Waste Management Act (Idaho)
ICDF	INEEL CERCLA Disposal Facility
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LDR	land disposal restriction
OU	operable unit
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SRPA	Snake River Plain Aquifer
SWFPR	site-wide false-positive rate
WAC	Waste Acceptance Criteria
WAG	waste area group
WLAP	Wastewater Land Application Permit

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1. INTRODUCTION

The U.S. Department of Energy Idaho Operations Office (DOE-ID) authorized a remedial design/remedial action for the Idaho Nuclear Technology and Engineering Center (INTEC) in accordance with the Waste Area Group (WAG) 3, Operable Unit (OU) 3-13 Record of Decision (ROD) (DOE-ID 1999). The OU 3-13 ROD requires the removal and on-Site disposal of some of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) remediation wastes generated within the boundaries of the Idaho National Engineering and Environmental Laboratory (INEEL).

The INEEL CERCLA Disposal Facility (ICDF) Complex is an on-Site, engineered facility, located south of INTEC and adjacent to the existing percolation ponds. Designed and authorized to accept not only WAG 3 wastes, but also wastes from other INEEL CERCLA actions, the ICDF Complex will include the necessary subsystems and support facilities to provide a complete waste management system.

The major components of the ICDF Complex include

- The disposal cells (landfill)
- An evaporation pond, consisting of two cells
- The Staging, Storage, Sizing, and Treatment Facility.

The ICDF Complex, including a buffer zone, covers approximately 40 acres, with a landfill disposal capacity of approximately 510,000 yd^3. The ICDF landfill meets the substantive requirements of Resource Conservation and Recovery Act (RCRA) Subtitle C (42 USC 6921 et seq.), Idaho Hazardous Waste Management Act (HWMA 1983), DOE O 435.1, and Toxic Substances Control Act (15 USC 2601 et seq.) polychlorinated biphenyl landfill design and construction. The landfill is the consolidation point for CERCLA-generated wastes within the INEEL boundaries. The landfill will be able to receive CERCLA-generated wastes outside WAG 3 that meet the land disposal restriction (LDR) requirements (DOE-ID 2002a). Waste generated within the WAG 3 area of contamination that has not triggered placement is not required to meet LDR criteria.

The evaporation pond, designated as a RCRA Corrective Action Management Unit in the OU 3-13 ROD, will be the disposal site for ICDF leachate and other aqueous wastes generated as a result of operating the ICDF Complex. In addition, other aqueous wastes such as existing Group 4 and Group 5 purge water may be disposed in the evaporation pond in accordance with the ICDF evaporation pond Waste Acceptance Criteria (WAC) (DOE-ID 2002b).

This Data Analysis Plan describes the approach that will be used to evaluate groundwater data collected in support of the ICDF detection monitoring program. This program has been established to meet the substantive requirements of 40 CFR 264.97 and 40 CFR 264.98. The detection monitoring program comprises two documents. All aspects related to collection of data and laboratory analysis are included in the Groundwater Monitoring Plan (DOE-ID 2002c), which is part of ICDF Remedial Design/Construction Work Plan (DOE-ID 2002d). The data analysis aspects of the detection monitoring program will be addressed under this Data Analysis Plan.

1.1 Objectives and Scope

The purpose of this document is to provide the basis for evaluating groundwater data collected under the Groundwater Monitoring Plan (DOE-ID 2002c). The scope of this document is to present the strategy that will be used to evaluate groundwater data in compliance with substantive RCRA Subpart F requirements (40 CFR 264, Subpart F).

1.2 Relationship to Other Documents

This Data Analysis Plan, along with the Groundwater Monitoring Plan (DOE-ID 2002c), constitutes the detection monitoring program for the ICDF. For ICDF groundwater information; details for all field work, including well drilling, sampling frequency and analytes; and laboratory analysis, refer to the Groundwater Monitoring Plan. Methods to evaluate data are addressed in this Data Analysis Plan. Currently, this Data Analysis Plan addresses the evaluation of the groundwater data associated with the Snake River Plain Aquifer (SRPA) wells. If the decision is made by the Agencies in spring 2003 that it is appropriate to add the routine monitoring of the perched water wells to the detection monitoring network, this Data Analysis Plan will be revised. In the event that there is a discrepancy between the two documents, this Data Analysis Plan supercedes the Groundwater Monitoring Plan.

2. DETECTION MONITORING PROGRAM FOR THE SRPA

Unless statistically significant evidence demonstrates a release from the ICDF, detection monitoring will be conducted at the ICDF as required by 40 CFR 264.98. The detection monitoring program developed for the ICDF groundwater monitoring wells is currently applicable to those six wells completed in the uppermost portion of the SRPA (i.e., one upgradient and five downgradient from the ICDF). The detection monitoring program will be modified as necessary to address the six perched water wells, as monitoring data and/or additional information become available.

As required in 40 CFR 264.98(a), any detection monitoring program must monitor for a set of indicator parameters, waste constituents, or reaction products "that provide a reliable indication of the presence of hazardous constituents in ground water." The *ICDF Complex Groundwater Monitoring Plan* (DOE-ID 2002c) presents the set of parameters to be monitored for at the ICDF SRPA wells. For each of the six SRPA monitoring wells, the methods established below for the detection monitoring program will be applied to each chemical parameter or hazardous constituent specified in the *ICDF Complex Groundwater Monitoring Plan*.

The ICDF detection monitoring program establishes the methods to be used to determine whether there is statistically significant evidence of contamination for any parameter monitored for at the ICDF SRPA wells. Detection monitoring does not include the investigation phase that will be conducted if statistically significant evidence is found that a release has occurred from the ICDF. Should a release occur, then the substantive requirements of 40 CFR 264.99 will be met and/or corrective action initiated.

2.1 Sample Frequency

As defined in the *ICDF Complex Groundwater Monitoring Plan*, the monitoring program includes a sequence of four background samples taken from the SRPA prior to startup of ICDF operations (DOE-ID 2002c). For the SRPA, background water quality will be established using water quality from the upgradient well and five downgradient wells prior to operation of the Complex. Due to preexisting contamination of groundwater in the vicinity of the ICDF Complex, the background water quality will represent baseline conditions because ICDF overlies existing SRPA contaminant plumes that originated from the former INTEC facility injection well, the former percolation ponds east of ICDF, and other facilities. More information on existing contamination can be found in DOE-ID (1997) and DOE-ID (2002e).

Beginning in June 2003, the SRPA will be sampled quarterly for indicator parameters for 1 year. It is anticipated that waste emplacement will occur in July 2003. Beginning in June 2004, sampling for these parameters will occur semiannually. Sampling the SRPA for a larger list of analytes will occur every 2-1/2 years. Refer to the *ICDF Complex Groundwater Monitoring Plan* (DOE-ID 2002c) for the list of parameters and for the associated Sampling and Analysis Plan tables for groundwater monitoring.

All sampling events, including the four background samples taken from each well prior to startup, will be taken at sufficient intervals to ensure temporally independent samples. Seasonal variation in groundwater quality is not expected based on SRPA data from INTEC wells.

2.2 Groundwater Flow Direction and Rates

As directed in 40 CFR 264.98(e), the ICDF groundwater monitoring program will determine the direction of flow in the uppermost aquifer on an annual basis. Water level measurements taken from each of the six SRPA wells during each sampling event will be used to determine the flow direction. Water level measurements from other wells at INTEC may be used as necessary to establish flow information.

Regional groundwater flow is generally south-southwest at average estimated velocities of 5 ft/day. The average groundwater velocity at INTEC is estimated at 10 ft/day due to local hydraulic conditions, based on information from pumping tests (LITCO 1995; DOE-ID 1997). The SRPA flow rate in the vicinity of the ICDF is not expected to vary much from year to year during the operation of the ICDF.

2.3 Statistical Methods for Groundwater Monitoring Data Evaluation

The use of several statistical methods is allowed when evaluating groundwater monitoring data in a detection monitoring program (40 CFR 264.97(h)). The method selected must be protective of human health and the environment and must comply with the performance standards outlined in 40 CFR 264.97(i). To ensure that the ICDF detection monitoring program meets the intent of 40 CFR 264.97, the method selected will be specific to each constituent.

Of the acceptable methods listed in 40 CFR 264.97(h), the ICDF detection monitoring program will use either prediction intervals as allowed in 40 CFR 264.97(h)(3) or control charts as allowed in 40 CFR 264.97(h)(4) to evaluate the groundwater monitoring data for statistically significant evidence of contamination. The specific method to be used for each constituent will be determined from the results of the background sampling and existing literature on constituent distributions.

For those constituents with at least 50% detected concentrations and where the distribution is approximately normal or lognormal, a combined Shewhart-cumulative sum (CUSUM) control chart method will be followed. For the remaining constituents, a nonparametric prediction interval method will be followed. For both of the selected methods, the applicable limits are based on the background information.

All groundwater monitoring analytical results will have undergone validation prior to use in either of the methods selected above and will retain all significant digits as reported by the analytical laboratory.

2.3.1 Basis for Selected Statistical Methods

Both prediction intervals and combined control charts allow for inter-well (i.e., upgradient versus downgradient) comparisons, as required in 40 CFR 264.98(f)(1). Combined control charts also retain information from previous sample periods, and, if an exceedance is observed in a given parameter at a downgradient well, the same parameter in the upgradient well can be inspected for a similar pattern for the same or previous time periods. Both prediction intervals and combined control charts have published tables to easily control site-wide false-positive rates (SWFPRs) when testing multiple wells and constituents (Gibbons 1999; Davis and McNichols 1994a). Avoiding an incorrect conclusion that a statistical exceedance exists (or controlling the SWFPR) is discussed in the data quality objectives established in Section 3 of the *ICDF Groundwater Monitoring Plan* and is discussed in detail in Section 2.6 of this plan. The false-negative rate for each contaminant will be determined for the method selected based on simulations of the baseline data.

2.3.1.1 Combined Shewhart-CUSUM Control Charts. The combined Shewhart-CUSUM control chart (Westgard et al. 1977; Lucas 1982; Starks 1989) compares sequential measurements in time against control limits, and any detection monitoring result above a control limit will be considered an exceedance. The combined Shewhart-CUSUM control chart has two control limits. The Shewhart component assesses one monitoring result at a time to detect large, sudden departures from the background level. The CUSUM component assesses available monitoring results cumulatively to detect gradual increases from background level.

The Shewhart control limit is defined to be

$$SCL = \bar{x} + zs$$

where

$\bar{x}$ = the background mean

s = the background standard deviation

z = the standard normal quantile for the chosen SWFPR.

The value for z specified by the Environmental Protection Agency (EPA 1992a, 1992b) and based on studies by Starks (1989) is 4.5. This means that a detection monitoring result that is 4.5 standard deviations larger than the background mean will be considered an exceedance. Based on simulations, the value of 4.5 provides a SWFPR for 5 wells and 63 constituents of 5% and a false-negative rate of no more than 20% for a difference of 3 standard deviations (Gibbons 1999). The value for z (i.e., 4.5) will be retained for the life of the SRPA detection monitoring program unless a change is agreed to with the Agencies.

The CUSUM control chart statistic for time i is defined to be

$$S_i = \max\left\{0, \frac{x_i - \bar{x}}{s} - k + S_{i-1}\right\}$$

where

$\bar{x}$ = the background mean

s = the background standard deviation

k = the displacement parameter (or the minimum number of standard deviations' change between one sample to the next that is added to the CUSUM statistic).

The CUSUM statistic is compared to the control limit h, which is the number of standard deviations shift before a result is considered an exceedance. The EPA (EPA 1992a, 1992b), based on studies by Starks (1989), recommends values of $k = 1$ and $h = 5$. For the CUSUM, a cumulative increase of $h = 5$ standard deviations will be considered an exceedance.

The advantages of the combined control chart are that it is graphical and easy to read, the method is somewhat robust to the assumption of normality (Starks 1989), and it can detect both sudden large impacts as well as gradual increases over time. The disadvantage is that the combined control chart and associated limits are more complicated to set up than some of the other methods.

2.3.1.2 Nonparametric Prediction Limits. The nonparametric prediction limit for a single future monitoring result (Davis and McNichols 1994a) makes no distribution assumptions although observations are assumed independent and identically distributed. The maximum background value is used as the nonparametric prediction limit, unless all results are nondetects. In these cases, the maximum quantification limit will be used as the prediction limit (ASTM D6312).

The advantages of the nonparametric prediction limit are that there are no distribution assumptions and can be used therefore for data with more than 50% nondetected concentrations, and it easily controls the SWFPR for testing multiple wells and constituents. The disadvantages are that a larger background sample size is required to obtain a reasonably small SWFPR and it is less powerful than parametric approaches if distribution assumptions could be met.

2.3.1.3 Other EPA-Accepted Methods. In addition to the use of prediction intervals or control charts, 40 CFR 264.97(h) allows for the use of analysis of variance, either parametric or based on ranks. However, neither of the analysis of variance approaches are deemed appropriate for ICDF detection monitoring. Both of the analysis of variance approaches, which make comparisons across wells, assume that the wells have independent and identically distributed values. However, natural spatial variability can exist among the wells and can result in significant results being incorrectly interpreted as contamination. The combined control chart and nonparametric prediction limits are performed on a by-well basis, so do not make the assumptions of independence among wells. Additionally, analysis of variance is not as powerful as other methods for detecting true contamination in a single well nor is it optimal for reducing the SWFPR (Davis and McNichols 1994b). Analysis of variance methods also require more than one independent result per well. The additional cost of sampling would severely impact the cost of operating the ICDF.

An alternative statistical test is allowed to be submitted for approval by the Agencies (40 CFR 264.97(h)). Because two of the approved methods were deemed appropriate for use in the SRPA detection monitoring program, no further statistical methods were investigated. If issues arise during implementation of the detection monitoring program with either of the two selected methods, Agency approval will be required prior to using an alternative statistical method to evaluate the groundwater monitoring data.

2.3.2 Dealing with Nondetected Results

As stated above, for those constituents with at least 50% detected concentrations and where the distribution is approximately normal or lognormal, a combined control chart method will be followed. When evaluating these parameters, any nondetected results will be replaced by 1/2 the reported detection limit and then evaluated by the combined control chart. Studies show that this simple replacement method is reasonable for up to 50% nondetected results (McNichols and Davis 1988; Davis 1994).

For those constituents with more than 50% nondetected concentrations, a nonparametric prediction interval method will be followed. A nonparametric approach is preferred for those constituents with a large percent of results reported as below the detection limit (McNichols and Davis 1988). Use of nonparametric methods for these parameters does not require any substitution for results reported as below the detection limit.

For those constituents with 100% nondetected concentrations, the associated prediction limit will be set at the maximum reported quantification limit (ASTM D6312). This prediction limit is referred to as the Lab Specific Prediction Limit in ASTM D6312.

2.3.3 Sample Independence

All samples taken as part of the ICDF detection monitoring program will be taken at sufficient intervals to ensure temporally independent samples. According to EPA guidance (EPA 1989), a sampling interval that ensures independent samples can be calculated by dividing the well diameter by the average horizontal linear groundwater velocity. Using a conservative estimate of average linear groundwater velocity of 5 ft/day (INTEC is typically 10 ft/day) (DOE-ID 2002c), a sampling interval of one day is more than adequate to ensure temporal independence. The volume of water in a 6-in. well bore is replaced 10 times in a day (0.5 ft/[5 ft/day] = 0.1 day). This average linear velocity of 5 ft/day is consistent with a hydraulic gradient south of ICDF of 2.65×10^{-3} (DOE-ID 2002e), a hydraulic conductivity of 100 ft/day for USGS-57 located within the ICDF fence (Ackerman 1991), and an effective porosity of 5% for the SRPA (DOE-ID 1997).

Sufficient time existed between well completion in the fall of 2002 and expected startup of the ICDF in the summer of 2003 to take the four required background samples at sufficient intervals to ensure independence. The samples were collected using a 2-week interval between sampling events to establish background conditions.

Routine detection monitoring (either quarterly or semiannually) will also allow a sufficient time interval for sample independence. Due to the time delay (up to 120 days) in obtaining validated sample results, any resamples will also be taken at sufficient intervals.

2.4 Establishing Limits Associated with Selected Statistical Methods

Background sampling results from all six SRPA wells will be used to determine which of the selected statistical methods is appropriate for each parameter and to establish the initial limits. Data distributions, extreme values, and percent of nondetected results from the background sampling will be used to determine the appropriate method (either the combined control chart or nonparametric prediction interval) for each parameter from each well. Then, limits will be calculated from the background data, as defined in Sections 2.3.1.1 and 2.3.1.2. Determining the limits also involves assigning false-positive and false-negative rates required for assessing statistically significant exceedances, as discussed in Section 2.6.

Limits will not be reevaluated after every sampling event. As part of the ongoing detection monitoring, the limits and methods selected for a given parameter/well will be evaluated every 2 years to incorporate additional data obtained after ICDF startup as recommended by ASTM D6312. Once the ICDF is operational, only additional monitoring data from the upgradient well can be pooled with baseline data to determine new control limits. Detection monitoring results obtained during each 2-year period will be incorporated with existing background data to reevaluate parameter estimates (i.e., mean and variance), percent nondetects, and methods selected, which may be used to determine new limits. The results will be incorporated into the next annual monitoring report. If issues arise during implementation of the detection monitoring program with either of the two selected methods (i.e., combined control chart or nonparametric prediction interval), Agency approval will be required prior to using an alternative statistical method to evaluate the groundwater monitoring data.

2.4.1 Assessing Temporal, Spatial, and Seasonal Variability

Seasonality in the SRPA in the vicinity of INTEC was evaluated using groundwater monitoring data from quarterly sampling by the U. S. Geological Survey and INEEL and semiannual sampling of the Wastewater Land Application Permit (WLAP) wells in and around INTEC. Quarterly sampling of well USGS-57 located on the southern boundary of the ICDF landfill has been conducted since the 1960s for both H-3 and Sr-90. Six years of WLAP sampling data (1995-2001) were evaluated for inorganic constituents including metals. The WLAP data were collected at the same frequency that is planned for the ICDF detection monitoring program.

Seasonality was assessed using Kendall's nonparametric test for seasonality and by looking for differences in the mean among seasons (after temporal detrending via regression). Kendall's nonparametric test for seasonality (Gilbert 1987) tests for differences in trend slope among seasons (for both quarterly and semiannual data). The second approach tests for differences among the residuals from the regression model (Gilbert 1987) using Wilcoxon's nonparametric test (for semiannual data) or Kruskal-Wallis nonparametric test (for quarterly data).

None of the constituents had significant seasonality according to Kendall's test. Using the second approach, the only constituent that had significant differences ($p = 0.022$) among the seasons was chromium from the WLAP data for well USGS-113. In this single case, the fall values were significantly greater than the spring values. None of the other wells or constituents exhibited this seasonality using either of the nonparametric tests in the second approach.

The baseline sampling at ICDF during the fall 2002 will be assumed to represent year-round conditions. Sampling in the fall should capture maximum seasonal concentrations if seasonal influences follow the pattern that was observed in only one well (USGS-113), for one constituent (Cr), using one of two statistical tests. While significant seasonal effects are not expected, seasonality in the monitoring data will be assessed as sufficient data become available (at least 5 years will be necessary). Spatial variability in the parameters and wells will be assessed as more detection monitoring data become available. Spatial variability will be assessed by comparing values (e.g., means, variances, distribution, and percent nondetects) among wells. Temporal trends will also be investigated when incorporating any new results with the existing background results and if the amended data set is found to have a temporal trend, the new results will not be used to calculate new control chart limits.

2.5 Resampling to Confirm Limit Exceedance

Once the ICDF becomes operational, any validated statistical exceedance for any parameter in any well will be investigated and the Agencies will be notified of the exceedance. The investigation will include resampling for the statistically significant exceedance or notification of the intent to make a determination that the source of the contamination is not the ICDF Complex. For resampling, DOE will collect two resamples for the contaminants that were statistically exceeded in each well that had an exceedance. If neither of the two resamples is an exceedance, then DOE resumes detection monitoring.

If either of the resamples confirms the initial exceedance and the source of the contamination is determined to be both a hazardous constituent and from the ICDF, then 40 CFR 264.99 requirements shall be triggered.

2.6 Controlling Site-Wide False-Positive and False-Negative Rates

The SWFPR is defined as the proportion of results from all ICDF wells for all constituents that exceed the detection monitoring limit when the contamination level is not actually above the background level, or simply as the probability of falsely claiming that the site is contaminated. The false-negative rate is defined as the probability that a result will not exceed the monitoring limit when the contamination level is actually above the background level, or simply as the probability of failing to detect increased contamination. The EPA recommends a SWFPR of no less than 5% and a false-negative rate of no more than 20% for an increase of 3-4 standard deviations (EPA 1992a). For ICDF detection monitoring, the SWFPR is determined separately for aquifer wells and for perched water wells and will be reevaluated every 2 years, as additional detection monitoring data are available.

The SWFPR associated with either the combined control chart or the nonparametric prediction limit depends on the background sample size, number of wells, number of constituents, the resampling scheme, and the values of z for the prediction limits or k and h for the combined control charts. As more monitoring results are available, the background sample size increases, and the SWFPR will decrease. The SWFPR will also change if the number of wells and/or constituents change. Thus, the SWFPR will be different for those constituents that are measured only every 2-1/2 years.

For the ICDF groundwater monitoring, four background samples will be taken from each SRPA well prior to startup. To control the initial SWFPRs, the background samples will be pooled (EPA 1992a), if the results from the background sampling of the six wells are found not to be significantly different. To determine if the initial background results can be pooled, the nonparametric Kruskal-Wallis Rank test

(Gilbert 1987) will be used to determine if the median concentration differs among wells, while the Levene's test (Madansky 1980) will be used to test for difference in well variance.

If the background results from the six wells can be pooled, then the initial SWFPRs and false-negative rates for the indicator parameters will be interpolated for the ICDF detection monitoring program based on 24 background samples, 5 downgradient wells, and 63 constituents, for a total of 315 tests each sample period. For the constituents that will be measured only every 2-1/2 years, the initial SWFPR will be larger due to the larger number of constituents monitored during the sample period. If the initial background results can be pooled, these SWFPRs will be based on 24 background samples, 5 downgradient wells, and 125 constituents (for a total of 625 tests).

Using all 24 background samples (i.e., pooling the initial background results) will provide desired false-negative rates of no more than 20% for the combined control chart and nonparametric prediction limits for either set of parameters. The SWFPRs will also meet the EPA recommendation of no less than 5%. For the combined control chart, the SWFPRs are 5% for annual sampling and 8% for sampling every 2-1/2 years. For the nonparametric prediction limit, the SWFPRs are 39% for annual sampling and 45% for sampling every 2-1/2 years.

If the results of the background sampling of the six SRPA wells are found to be significantly different, then the background results will not be pooled and the limits and associated SWFPRs will be adjusted to account for the intra-well comparisons. The SWFPRs will be even higher than those listed above (e.g., in the 70–100% range), although the false-negative rate should remain below the 20% for 3 standard deviations.

Once the analysis from the background sampling of the SRPA wells is completed, the SWFPR will be determined for the subsequent sampling. The list of constituents to be sampled may be modified with Agency approval to reduce the SWFPR to reasonable limits. Also, as stated above, the limits will be reevaluated every 2 years as part of ongoing detection monitoring. During this evaluation, the SWFPR will also be reevaluated, incorporating any changes in background sample size due to additional monitoring.

2.7 Reporting of Detection Monitoring Results

During the lifetime of the ICDF, all detection monitoring analytical results will be transmitted to the Agencies in accordance with the Federal Facility Agreement and Consent Order (DOE-ID 1991). Either the unvalidated analytical Form 1's will be transmitted to the Agencies or the data will be discussed with the Agencies on a conference call, unless a more complete unvalidated data package is requested specifically by the Agencies. In addition, the results of the ICDF detection monitoring will be documented in annual reports to the Agencies. The annual reports will discuss the methods selected and the associated background limits established for each parameter, the results of any resampling, the impacts of seasonal and spatial variability, and any temporal trends found. The first annual report will be prepared once the ICDF is operational and the initial four rounds of quarterly sampling results have been validated and evaluated. Subsequent annual reports will incorporate each additional year of sampling results.

2.8 Deepening or Replacing SRPA Wells

In the event that any SRPA detection monitoring wells need to be deepened due to declining water levels over time, or replaced due to well failure, the following method will be used to incorporate new data into the detection monitoring program. Changes to well depth or location will be documented in a revision to the Groundwater Monitoring Plan (DOE-ID 2002c) and results summarized in an annual report. If possible, the replacement well will monitor a similar zone, or in the case of a SRPA well going dry, the replacement well or deepened well will monitor the upper part of the SRPA. If a well needs to be abandoned, it will be sealed in compliance with substantive State of Idaho requirements. Four quarterly samples will be collected from the new well and the data will be compared to the existing baseline and/or monitoring data to determine if there is a statistical difference between the data sets. If there is no significant statistical difference between the data sets, then monitoring and analysis will continue and the data from the new well will be incorporated into the detection monitoring program and the data from the old well will be retained. Additionally, differences between the two wells will continue to be looked at, as additional monitoring data from the new well become available. If there is a statistically significant difference between the data sets, then the data from the old well will be excluded from the detection monitoring program and the data from the new well will be compared to both baseline and monitoring data from other wells. If the new well differs from other monitoring wells, data from the new well will not be pooled and intra-well comparisons will be made. If the new well does not differ from the other monitoring wells, then the data from all wells will be pooled. For all comparisons discussed above, the mean, variance, and distribution will be compared using methods discussed in Section 2.6 to determine if differences between wells exist.

3. INVESTIGATION OF CONFIRMED EXCEEDANCES

If one or both of the resamples are validated statistical exceedances, DOE will notify the Agencies and take appropriate actions to determine the source of contamination. DOE will immediately begin working with the Agencies on an investigation into the source of the exceedance, including reviewing available historical leachate sump sampling results, leachate pumping records and expected volumes, and perched water sampling results. A report will be prepared and submitted to the Agencies within 180 days of making the notification to take appropriate actions.

Because of preexisting contamination in the vicinity of the ICDF Complex, it is possible that statistically significant increases could be related to a source other than the ICDF. Exploring for other potential sources is allowed (40 CFR 264.98(g)(6)). As such, data from the leachate collection recovery system, the primary and secondary leak detection and recovery systems, water levels, existing wells, and all detection monitoring sampling activities will be used as lines of evidence to determine whether the statistically significant increase in contamination is related to the operation of the ICDF.

4. SCHEDULE FOR EVALUATION OF PERCHED WATER

Four rounds of initial background sampling of the perched water were completed December 3, 2002. The Agencies will receive validated data no later than April 2, 2003. A conference call or meeting to discuss the appropriateness of adding perched water to the detection monitoring network and statistical techniques for the evaluation of perched water data will be held with the Agencies by the end of May 2003. If it is appropriate to add the perched water wells to the detection monitoring network, a schedule for revising this Data Analysis Plan to incorporate perched water will be set.

5. REFERENCES

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